PAPERS OF THE EAST-WEST POPULATION INSTITUTE, published about eight times a year, facilitate early dissemination of research findings and policy-relevant reports on the populations of Asia, the Pacific, and the United States. Cost per copy, $3.

NOTE TO CONTRIBUTORS: The Population Institute considers unsolicited as well as commissioned manuscripts for the Paper Series. Appropriate topics are demographic trends and estimation, fertility and family structure, economic development and human resources, urbanization and migration, and population policies and programs. All manuscripts are reviewed. In selecting manuscripts for publication, the Institute considers quality of scholarship and usefulness to public officials and other professionals in the field of population; it also seeks contributions reflecting diverse cultural and disciplinary perspectives on population. The series can accommodate articles not necessarily suited for journals because of unusual length or treatment of subject. All copy must be typed double-spaced. For additional information on manuscript preparation, write to Editor, Paper Series.

OTHER SERIAL PUBLICATIONS OF THE EAST-WEST POPULATION INSTITUTE

Working Papers are circulated for comment and to inform interested colleagues about work in progress at the East-West Population Institute. They are intended to complement evidence of completed work as reflected in Papers of the East-West Population Institute and the Reprint Series. $1 per copy.

Reprint Series brings selected articles originating from Institute research but published elsewhere to the attention of population specialists who might not otherwise see them. Single copies available upon request.

Asian and Pacific Census Forum is a quarterly periodical reporting on census, vital registration, and population survey activities in Asia and the Pacific. The *Forum* contains technical articles on a range of topics related to demographic measurement, and reviews of new publications in the field. Issued in August, November, February, and May. Annual subscription rate, $5.

Serial publications except Working Papers are availabie without charge to libraries serving population specialists and to professionals and scholars in the field of population. Requests describing the nature of the research or program and the intended use of the publications should be addressed to: Publication Sales and Distribution, East-West Center.

East-West Population Institute
East-West Center
1777 East-West Road
Honolulu, Hawaii 96848

Director *Lee-Jay Cho*
Senior Editor *Sandra E. Ward*
Editor *David Ellis*

R4500-1.40
F

Factors in the achievement of below-replacement fertility in Chiang Mai, Thailand

Tieng Pardthaisong

Number 96 • March 1986

PAPERS OF THE EAST-WEST POPULATION INSTITUTE

TIENG PARDTHAISONG is Assistant Professor of Community Medicine in the Faculty of Medicine, Chiang Mai University, Thailand.

Library of Congress Cataloging-in-Publication Data

Tieng Pardthaisong.
Factors in the achievement of below-replacement fertility in Chiang Mai, Thailand.

(Papers of the East-West Population Institute ; no. 96)
Bibliography: p.
1. Birth control—Thailand—Chiang Mai (Province) 2. Fertility, Human—Thailand—Chiang Mai (Province) 3. Birth control—Government policy—Thailand—Chiang Mai (Province) I. Title. II. Series.
HQ766.5.T5T53 1986 363.9'6'09593 86-4584
ISBN 0-86638-074-4

CONTENTS

Acknowledgments *vii*

Abstract *1*

Purpose and background of the study *2*

Area studied and study design *4*

Socioeconomic characteristics of respondents *6*

Family-size preferences *9*

Changes in fertility since the early 1950s *10*

- Birth-history analysis *10*
- Fertility trends estimated from several sources *11*
- Cohort analysis *14*
- Evidence from the age structure *17*

Changes in the marriage pattern *19*

Use of modern contraceptives *23*

- Current contraceptive practice *25*
- Ever users of contraceptives *29*
- Methods of contraception used *30*
- Age patterns of first use *30*
- Parity levels at first use *33*
- Sources of modern contraceptives *35*
- Factors in nonacceptance *37*

Factors in Chiang Mai's rapid fertility decline *41*

Discussion *43*

References *45*

FIGURES AND TABLES

Figures

1. Chiang Mai Province, divided into five study areas having varying degrees of accessibility to Chiang Mai City 3
2. Fertility levels of the Chiang Mai population from 1954–58 to 1974–78, by study area 15
3. Age structures of Chiang Mai Province (1960 and 1970), Chiang Mai City (1980), and rural areas of Chiang Mai Province (1979) 20
4. Percentage of Chiang Mai women single in 1960, 1970, and 1979–80 21
5. Percentage of Chiang Mai women single, by study area, in 1979–80 22
6. Percentage currently practicing contraception among women living with their husbands and not pregnant at the time of interview, by study area and age 26

Tables

1. Chiang Mai residents who ever attended school, by school level, study area, age, and sex (%) 7
2. Households owning selected modern conveniences, by study area (%) 8
3. Households in specified economic categories as estimated by interviewers, by study area (%) 8
4. Ideal family size, planned family size, and number of live births of women in Chiang Mai City and all rural areas, by age 9
5. Unknown birth dates of children, by age of women and study area (%) 11
6. Fertility levels in Chiang Mai Province estimated from various sources 12
7. Proportion of 1964–78 age-specific fertility decline occurring between 1969–73 and 1974–78, by age and study area (%) 13
8. Total fertility at exact ages among women in each five-year period from 1954–58 to 1974–78, by study area 14
9. Fertility estimates for 1960–80 based on 1970 and 1980 census data (with two assumptions of life expectancy) and on birth-history data from the Chiang Mai Fertility Survey, by study area 16
10. Mean number of children ever born (per woman) for women born between 1919 and 1963, by study area 18

11. Mean age at first marriage and mean number of live births of Chiang Mai women, by study area and birth cohort, 1919–63 *24*

12. Percentage currently practicing contraception among women living with their husbands and not pregnant at time of interview, by study area, contraceptive method, and age *27*

13. Ever married women who had ever used specified contraceptive methods, by age and study area (%) *28*

14. Women in rural areas who had ever used orals or injectables, by age at interview and year when specified method was first used (%) *31*

15. Women in Chiang Mai City who had ever used orals or injectables, by age at interview and year when specified method was first used (%) *32*

16. Women in rural areas who had ever used orals or injectables, by age at interview and birth order when specified method was first used (%) *34*

17. Women in Chiang Mai City who had ever used orals or injectables, by age at interview and birth order when specified method was first used (%) *36*

18. Contraceptive acceptors, by study area, source of supplies, and first method used (%) *38*

19. Mean number of children ever born to contraceptive users and nonusers in Chiang Mai City and rural areas, by age *40*

ACKNOWLEDGMENTS

I am very grateful to my supervisors, Professor William Brass and Professor Ronald H. Gray, for their enthusiasm and advice throughout this research project. My special thanks go to the many people who provided help to me during this research, including Professor John Knodel for his comments on the first draft of this paper; to Andrew Westlake and Miss Judy Bailey for their advice on the computer analysis; to Dr. Edwin B. McDaniel for providing facilities for the demographic survey; to Mrs. Paipunee Suwanprathet for supervising the fieldwork interviews and data coding; and to the United Kingdom's Overseas Development Administration (ODA) for funding the project. My own views are not necessarily shared by that Administration.

Support for this publication came from a cooperative agreement with the Office of Population, U.S. Agency for International Development.

ABSTRACT This study investigates the contribution of family planning programs to the decline of fertility in Chiang Mai Province. Family planning programs were introduced into the province in 1963. The analysis is based on a random sample of 3,805 ever married women from a demographic sample survey conducted in Chiang Mai Province between 1979 and 1980.

Despite large differences in degrees of modernization between Chiang Mai City and the rural areas of the province, fertility has fallen rapidly in all sectors of the population. In Chiang Mai City, fertility began to decline rapidly after 1954–58 in every age group, especially among older women, and reached a level lower than replacement in 1974–78. In the periurban, rural, and remote rural populations the fertility decline started after 1959–63 from higher levels but was more rapid than that of the city population. By 1974–78 all sectors of the Chiang Mai population had almost equally low fertility levels.

Age at marriage in Chiang Mai Province increased only slightly between 1960 and 1980, but the tendency of urban women to marry at later ages than rural women persisted. There is no evidence of a change in marital stability during the study period. The increase in age at marriage can account for only a small share of the observed fertility decline.

Most of the rapid fertility decline in the Chiang Mai population can be attributed to the family planning programs, for the following reasons. First, although older women in Chiang Mai City accepted modern contraceptives more readily than those in the rural areas, the difference in acceptance rates diminished in the younger age groups, which had been exposed to the programs; within the most reproductive age group at the time of the survey the proportions of contraceptive acceptors were equal in all study areas. Second, only a small proportion of women with very low fertility did not use modern contraceptives. The study thus concludes that family planning programs are one of the best possible means of slowing population growth rates to desired low levels in both city and rural populations.

As one of the first programs of its kind in Thailand, a family planning program was introduced at Chiang Mai's McCormick Hospital in 1963, seven years before the start of the Thai National Family Planning Program. Since then additional programs have been established, including an urban family planning clinic in Chiang Mai City begun in 1967 and a mobile family planning unit with 38 work points that has served a rural population since 1969. In 1967 the Thai government launched a pilot project of distributing oral contraceptives through its first- and second-class health centers. From 1972 onward much of the family planning work was done by auxiliary nurse-midwives based in government midwifery stations.

The intrauterine device (IUD) was the first modern contraceptive method to be introduced on a wide scale in the Chiang Mai area (1963). It was followed by the injectable contraceptive Depo Provera (1965). Ow-

ing to the popularity of Depo Provera, Chiang Mai has what may be the largest injectable contraceptive program in the world.

The early introduction of family planning programs and the varied types of clinics and contraceptive methods have distinguished the Chiang Mai population program from others in Thailand. If family planning services contribute to slowing population growth, then the program in Chiang Mai deserves attention from policymakers interested in reducing population growth rates.

PURPOSE AND BACKGROUND OF THE STUDY

The present study aims to document the fertility decline in Chiang Mai and to assess the impact of family planning programs and other intermediate variables on the fertility of Chiang Mai women. Drawing on findings from a demographic sample survey, the paper compares socioeconomic characteristics and attitudes toward family size of Chiang Mai's urban and rural populations, describes the patterns of fertility decline in each study area over the period from 1954 to 1978, and examines the importance of nuptiality and family planning accessibility in accounting for Chiang Mai's rapid fertility decline.

The findings show that fertility has declined rapidly to below the replacement level among both urban and rural populations of Chiang Mai despite socioeconomic differences between study areas. Differences in marriage patterns have had a negligible effect on fertility. Widespread knowledge and acceptance of contraception among all sectors of Chiang Mai Province's population are responsible for most of the decline in birth rates.

A rapid fertility decline in Chiang Mai beginning in 1964 has been documented by a previous study (Pardthaisong 1978) based on birth registrations during 1950–75, by Thailand's population censuses of 1960 and 1970, and by school registration figures for 890 primary schools over the period from 1962 to 1974. The total fertility rate in Chiang Mai Province fell by almost 50% between 1960 and 1975. Moreover, the 1978 study indicated that four areas of the province containing 93% of its population (areas A, B, C, and E in Figure 1) began to experience fertility declines at the same time, in 1964. Fertility began to decline somewhat later in study area D, where most people live in isolated, mountainous settlements. The study found that changes in marriage patterns between 1960 and 1970 were insufficient to explain the rapid drop in birth rates but that the fertility decline did coincide to a considerable extent with the expansion of family planning programs in the province

A 1976 demographic sample survey by Shevasunt et al. in rural areas of Chiang Mai and in nearby Chiang Rai Province found that birth rates began to fall about five years earlier in Chiang Mai than in Chiang Rai and

Source: Pardthaisong (1978, figure 4).

Figure 1. Chiang Mai Province, divided into five study areas having varying degrees of accessibility to Chiang Mai City

that Chiang Mai's fertility decline was somewhat closer to completion (Shevasunt et al. 1978). The marital total fertility level in Chiang Mai was estimated to be 4.42 children per woman in 1968 and 2.29 in 1976; corresponding estimates for Chiang Rai were 5.38 in 1968 and 3.41 in 1976. The fact that family planning programs were introduced five years later in Chiang Rai than in Chiang Mai indicates that fertility decline was more or less coincident with the introduction of family planning services in each province.

The survey by Shevasunt et al. agrees well with my own previous study referred to above, but it has several important limitations. The sample size was relatively small (796 women in Chiang Mai and 997 women in Chiang Rai), the fertility estimates could be made back to 1968 only, and the estimated values for some years were lower than those from estimates based on incomplete birth registrations.

The present study differs from previous studies in that it focuses entirely on Chiang Mai Province, includes both the urban and rural populations of the province, and has a larger sample size. Altogether, 3,805 ever married women were interviewed during 1979–80. Their fertility levels can be reliably estimated as far back as the 1950s, a period before the introduction of family planning programs in Chiang Mai, and comparisons can be made between the city of Chiang Mai and rural areas. That fertility levels before the introduction of family planning programs are known is important for evaluating the programs' impact. Comparisons between city and rural areas provide a better basis for developing family planning strategies to reduce population growth rates to desired levels.

AREA STUDIED AND STUDY DESIGN

Chiang Mai Province, the setting of this study, is the seventh largest of Thailand's 71 provinces and the second largest province in northern Thailand. Its central city, Chiang Mai, is 800 kilometers north of Bangkok. The terrain is mountainous, with interspersed plateaus and valleys. Transportation between population centers, primarily in the valleys and plateaus, varies in quality from excellent to very poor. The province's population was 798,483 in 1960, 1,026,450 in 1970, and 1,154,850 in 1980, the increases representing an average annual growth rate of 2.6% between 1960 and 1970 and 1.2% between 1970 and 1980. Almost 92% of its inhabitants in 1970 were rural, and there was no significant increase in the proportion of people living in municipal areas during 1970–80. The proportion of women of ages 15–44 who had four or more years of education increased from 40 to 64% between 1960 and 1970 and rose to 80% by 1980.

Chiang Mai is a large province, covering 22,993 km^2 and stretching for more than 300 km from south to north. The province comprises nineteen

districts. For the purpose of this study, it is divided into five study areas (Figure 1).

Area A is Chiang Mai City, which in 1980 contained 182,134 people. Its population has good access to governmental and nongovernmental services.

Area B, comprising the seven urban peripheral districts surrounding Chiang Mai City, contained 455,366 people in 1980. Transportation by small buses from these districts to Chiang Mai is convenient during all seasons.

Area C, consisting of two parts, includes six rural districts whose combined population was 285,570 in 1980. Most of the population is concentrated in valleys. Transportation to Chiang Mai City is possible during all seasons.

Area D, also in two parts, consists of three rural districts which in 1980 had a population of 81,415, widely dispersed in mountainous areas. Transportation to Chiang Mai City is possible only in the dry season, and even then it entails some difficulty.

Area E consists of two rural northern districts. As of 1980 there were 150,362 inhabitants living in an isolated wide valley, with few opportunities to obtain services from Chiang Mai City.

A demographic sample survey of four of the five study areas was conducted in late 1979 and early 1980. Two stages of random sampling were used to select a statistically representative sample. The probability of selection was equal in study areas B, C, and E. Owing to the difficulty of communicating with the many hilltribe populations in area D, the study excluded that area, which comprises 7.1% of the province's population. Because the population of Chiang Mai City is small, the probability of being randomly selected for the sample was double that of the rural areas. The survey completed interviews with 3,805 ever married women: 841 in Chiang Mai City, 1,666 in the periurban sector (area B), 885 in the rural areas less accessible to Chiang Mai City (area C), and 413 in the rural population more remote from Chiang Mai City (area E).

In the sample households every woman who had ever married was interviewed. The interview covered questions about household members, the respondent's background, her pregnancy history, her knowledge and use of contraception, her marriage history, socioeconomic data, and her perception of the costs and benefits of having children. The questionnaires were from the World Fertility Survey (Basic Document No. 1 and Occasional Papers 19 and 12) and had been translated into Thai.

The interviews took place between January and September 1979 in rural areas and during March 1980 in Chiang Mai City. A research assistant and I enlisted the support of a village headman in each village before undertaking the interviews. The headman was asked to review a list of eligible

respondents and to make appointments with the respondents for the interviews.

The data collection team consisted of six to nine interviewers. The headman and his assistant directed the interviewers to their assigned cases (approximately four to five cases a day for each interviewer). Every ever married woman under age 60 in the household was interviewed. The research director supervised the fieldwork. At the end of each day a research assistant checked the completed questionnaires for internal consistency and discussed any problems with the responsible interviewer.

SOCIOECONOMIC CHARACTERISTICS OF RESPONDENTS

Family planning services in Chiang Mai Province have been available to urban and most rural inhabitants since the 1960s, the exception being the hilltribe populations in the mountainous areas. The impact of family planning on birth rates should therefore be observable in both urban and rural areas. One question this study addressed was the extent to which differences in such characteristics of individuals as education and occupation affect contraceptive use where family planning services have been available for many years. Socioeconomic factors, including education, have been shown to be important correlates of fertility levels in many other populations.

The present study found that major socioeconomic differentials existed between the study areas. They included differences in education, use of electricity, ownership of modern consumer goods, housing conditions, and economic status.

Nearly everyone interviewed between the ages of 10 and 29 in each area had attended primary school (Table 1). Equally high percentages of younger males and females had received a primary school education regardless of residential area, though among older respondents greater percentages of males and residents of Chiang Mai City had attended primary school. A major difference in school attendance between the populations of Chiang Mai City and the rural areas emerged at the secondary and higher level. There the advantage enjoyed by males was also more pronounced, especially among older people and in rural areas.

Electricity was first introduced in Chiang Mai City and later spread to towns and villages of other districts in the province. At the time of the survey, differences in household electrical use between the city and rural populations were still large: users constituted 92% of surveyed households in the city, 62% in periurban areas, 22% in rural areas, and 29% in the remote rural areas.

Most of the survey population, especially those living outside Chiang Mai City, owned their own houses. Homeowners comprised 81% of the

Table 1. Chiang Mai residents who ever attended school, by school level, study area, age, and sex (%)

Age at interview	Chiang Mai City		Periurban area		Rural area		Remote rural area	
	Male	Female	Male	Female	Male	Female	Male	Female
Primary school								
10–14	99	99	100	99	98	99	100	98
15–19	100	99	99	99	95	98	99	97
20–24	99	98	98	98	96	89	97	94
25–29	99	98	98	96	97	86	96	90
30–34	98	98	95	99	88	80	100	83
35–39	98	96	97	90	91	87	98	81
40–44	94	91	89	86	89	77	85	78
45–49	94	90	92	85	79	77	89	71
50–54	97	86	90	72	82	66	74	56
55–59	87	62	74	32	68	36	70	21
60+	76	28	47	11	35	12	38	12
Secondary school or higher								
15–19	62	61	26	30	14	11	25	17
20–24	60	51	24	16	8	6	21	12
25–29	56	41	13	5	9	3	12	9
30–34	47	44	11	7	4	2	2	2
35–39	37	36	15	7	6	2	18	8
40–44	34	20	9	1	6	0	7	6
45–49	34	20	4	1	5	0	6	2
50–54	30	17	8	3	5	0	6	2
55–59	25	16	2	2	0	0	0	0
60+	25	2	2	1	1	0	5	0

Note: Data on males supplied by female respondents.

respondent families in Chiang Mai City, 93% in the periurban areas, 96% in the rural areas, and 91% in the remote rural areas. Most of the families built the walls and floors of their houses with permanent materials such as wood or concrete. Residents in Chiang Mai City had the lowest proportion (7.5%) of houses constructed of less permanent materials, such as bamboo; the proportions were 21% in periurban areas, 17% in rural areas, and 28% in the remote rural areas. Similarly, proportionately fewer homes in Chiang Mai City had roofs made of impermanent materials (e.g., grass, leaves, or dirt) than in the other survey areas.

Residents of Chiang Mai City owned more modern conveniences such as refrigerators, television sets, radios, and sewing machines than did residents in the other survey areas (Table 2). Only bicycles were owned by more people in the periurban and remote rural areas than in Chiang Mai City. The most common possession of all groups was a radio, which nearly all households owned.

More very poor people were living in the rural and remote rural areas than in the city and the periurban areas (Table 3).

Table 2. Households owning selected modern conveniences, by study area (%)

Convenience	Chiang Mai City (N = 841)	Periurban area (N = 1,666)	Rural area (N = 885)	Remote rural area (N = 413)
Refrigerator	47	8	2	7
Television set	60	14	2	3
Air conditioner	3	0	0	0
Radio	92	85	80	82
Watch	87	51	35	43
Sewing machine	48	28	19	20
Bicycle	61	70	46	68
Motorcycle	55	34	23	25
Car	23	6	3	6

Table 3. Households in specified economic categories as estimated by interviewers, by study area (%)

Economic status	Chiang Mai City (N = 841)	Periurban area (N = 1,666)	Rural area (N = 885)	Remote rural area (N = 413)
Very poor	14	25	34	30
Poor	4	7	13	8
Below average	22	8	12	10
Average	38	45	33	38
Above average	2	2	2	3
Good	17	11	4	9
Very good	3	1	1	2
Unknown	0	0	1	0
Total	100	100	100	100

Notes: Percentages may not sum to 100 because of rounding. Interviewers were asked to estimate the economic status of each respondent's household immediately after completing the interview. Although this estimation method was subjective, it was believed to be reasonably accurate.

FAMILY-SIZE PREFERENCES

Respondents were asked about their ideal family size, planned completed family size, and the number of live births they had already experienced (Table 4). The number of children considered to constitute an ideal family size in Chiang Mai Province was remarkably low. The mean ideal was 2.8 children per ever married woman in Chiang Mai City and 2.7 in all rural areas. Eighty-one percent of respondents wanted a family of three or fewer children, and half (49.7%) considered a family of two children to be ideal. This ideal is small compared with findings from village surveys (McDaniel and Pardthaisong 1973) in Chiang Mai in 1967 and 1969, in which 46.7% and 47.2% respectively of ever married women identified a family size of three children as ideal. The difference between those findings and the more

Table 4. Ideal family size, planned family size, and number of live births of women in Chiang Mai City and all rural areas, by age

Study area and age at interview	Ideal family size (no. of children)		Planned family size		Live births	
	Mean	SD	Mean	SD	Mean	SD
Chiang Mai City						
15–19	2.3	0.9	1.9	1.1	0.3	0.5
20–24	2.1	0.6	1.8	0.8	1.1	0.7
25–29	2.4	0.8	2.1	0.9	1.5	1.0
30–34	2.3	0.8	2.4	0.9	2.0	1.1
35–39	2.7	1.5	3.2	1.7	3.1	1.8
40–44	2.9	1.6	3.7	2.3	3.7	2.3
45–49	3.2	1.6	4.6	2.2	4.6	2.2
50–54	3.4	2.0	5.0	2.8	5.0	2.8
55–59	3.1	1.6	5.2	3.1	5.1	3.1
All ages	2.8	1.5	3.6	2.4	3.3	2.6
All rural areas						
15–19	2.1	0.5	1.7	0.9	0.5	0.6
20–24	2.1	0.6	1.9	0.9	1.0	0.8
25–29	2.3	0.8	2.2	1.0	1.8	1.0
30–34	2.4	0.8	2.6	1.3	2.3	1.4
35–39	2.7	1.3	3.6	1.9	3.5	2.0
40–44	2.9	1.2	4.5	2.4	4.5	2.4
45–49	3.0	1.6	5.5	2.7	5.5	2.7
50–54	3.4	1.9	6.1	3.0	6.1	3.0
55–59	3.3	2.0	6.0	3.1	6.0	3.1
All ages	2.7	1.4	3.9	2.7	3.6	2.9

SD—standard deviation.

recent responses indicates that in the past decade ideal family size for both urban and rural Chiang Mai women declined to a small size.

Moreover, ideal family size was lower among younger women in both Chiang Mai City and all rural areas. Although mean ideal family size was more than three children for women of ages 45 and over, it was only slightly more than two children for women under 25. This finding suggests that younger women in Chiang Mai now consider replacement-level fertility to be the norm.

As with ideal family size, the survey found planned completed family size to be dramatically lower among younger women. Respondents 50 years old and older in Chiang Mai City had an average completed family size of more than five children, whereas women under age 25 planned to complete their families with an average of slightly less than two children. The findings were the same for women in rural areas. It is noteworthy that planned completed family size was smaller than ideal family size among women under 25, suggesting that their completed fertility may be well below the replacement level of 2.3 births.

Changes in actual family size, which can be observed from the mean number of live births, have been dramatic. Among women who have reached the end of their reproductive period, family size has been declining. Women in the age groups 30–34 and 35–39 had a mean number of live births almost equal to their planned completed family size. Women in the most active reproductive age group (25–29), however, needed an average of only 0.5 more children to attain their planned completed family size. The comparable figure for women under age 25 was 1.0 more children.

CHANGES IN FERTILITY SINCE THE EARLY 1950S

Birth-history analysis

To gain a better understanding of why family size has been reduced so dramatically in Chiang Mai Province over the past three decades, I estimated fertility levels and trends from birth-history data. This technique of fertility analysis has been discussed by Brass and Rashad (1980) and used by the World Fertility Survey to estimate fertility in many countries.

My Chiang Mai Fertility Survey differed from other fertility surveys in two ways. First, ever married women of ages 15–60 were interviewed, whereas most surveys include only women up to age 50 or less. The main advantage of including older women is that changes in completed fertility can be analyzed for longer time spans than would otherwise be possible. The other difference was the manner of dealing with the problem of unknown birth dates of children, which can be a severe limitation of this technique if the proportion of such unknown dates is large. Other surveys

have coped with this problem by imputing birth dates, thus providing more complete coverage. The imputation method has been criticized, however, for being overly subjective. I therefore chose not to use imputation for the unknown dates and instead omitted such births.

Fertility levels presented in this paper are thus underestimated by the proportion of births of unknown dates, which varies from 0.9% in Chiang Mai City to 4.1% in the periurban areas (Table 5). The differences between individual rural areas were found not to be substantial. But among older women, unknown birth dates of children are common, and most of them are in birth orders 1, 2, and 3. Thus their effect on the estimated fertility level is to understate fertility levels in the early period being investigated.

Another source of possible bias in the fertility analysis is age heaping, the tendency of respondents to round their dates of birth to years ending in 0 or 5. But the Chiang Mai Fertility Survey obtained women's birth dates from household registration certificates. In addition, the age analysis is calculated from 1 January 1979 and the women's dates of births. Therefore, the possibility of bias due to age heaping in the current analysis should be diminished.

Fertility trends estimated from several sources

Total fertility rates of the Chiang Mai population from 1964 to 1978 calculated from three sources of data are shown in Table 6. The fertility levels and trends estimated from the Chiang Mai Fertility Survey data agree reasonably well with those reported in previous studies. They are higher than the

Table 5. Unknown birth dates of children, by age of women and study area (%)

Age of women at interview	% of unknown birth dates				
	Chiang Mai City	Periurban areas	Rural areas	Remote rural areas	All rural areas
< 20	0	0	0	0	0
20–24	0	0	0	0	0
25–29	0	0.8	0	0	0.4
30–34	0.5	0.3	2.1	2.6	1.3
35–39	0	3.2	0.7	0.5	2.0
40–44	0	2.6	2.5	0	2.2
45–49	0.2	3.4	3.1	3.1	3.2
50–54	2.2	5.7	3.7	7.9	5.3
55+	3.8	9.0	9.4	14.9	9.6
All ages	0.9	4.1	3.1	3.8	3.7

Table 6. Fertility levels in Chiang Mai Province estimated from various sources

Year	Birth registration data	Chiang Mai Fertility Survey	Northern Thailand Fertility Survey
1964	4.90		—
1965	4.49		—
1966	4.29 (4.23)[a]	(4.92)	—
1967	3.86		—
1968	3.60		4.42
1969	3.32		4.00
1970	3.07		3.37
1971	2.98 (3.06)[a]	(3.27)	3.03 (3.32)[a]
1972	3.08		2.76
1973	2.83		2.93
1974	2.72		2.65
1975	2.67		2.49
1976	—	(1.85)	2.29
1977	—		—
1978	—		—

Sources: Birth registration data: Pardthaisong (1978, table 5); Chiang Mai Fertility Survey: derived from Table 8; Northern Thailand Fertility Survey: Chiang Mai University and University of Chicago (1979, table 3.3).

a. Average total fertility for five-year period.

values estimated from the vital registration data for the periods 1964–68 and 1969–73. This is what one would expect, since birth registration data are believed to be incomplete. In addition, the rate for 1969–73 (3.27 children per woman) agrees well with that derived from the Northern Thailand Fertility Survey (3.32).

Of note is the continuing fall of the fertility rate, to 1.85 in 1974–78, as estimated from the Chiang Mai Fertility Survey data. That level is significantly lower than replacement. The other two sources also suggested a downward trend but reported somewhat higher levels for the mid-1970s. Two possible factors may explain this. One is that many women in the Chiang Mai survey may have forgotten their children's birth dates or failed to report accurately the number of births they had during 1974–78. This seems unlikely because 1974–78 was the most recent period at the time of the survey. The other explanation might be that many women in every age group deliberately spaced their births in the period 1974–78 and thus affected the total fertility rate. This seems to be the case because the accelerated decline in fertility is evident in every age group between 1969–73 and 1974–78. As Table 7 shows, the fertility decline during this five-year period

Table 7. Proportion of 1964–78 age-specific fertility decline occurring between 1969–73 and 1974–78, by age and study area (%)

Age group	% of fertility decline	
	Chiang Mai City	All rural areas
< 20	48	43
20–24	19	44
25–29	29	33
30–34	36	47
35–39	38	31
40–44	44	59
45–49	71	66
Total	34	43

was equal to nearly 50% of the entire decline that had occurred since the mid-1960s.

As Table 8 and Figure 2 reveal, there has been a dramatic fertility decline in every age group since 1954–58 among women in Chiang Mai City and since 1959–63 among women in the other study areas. By 1974–78, fertility had reached levels lower than replacement in all study areas.

The amount of fertility decline has been directly correlated with women's ages, being 40% for the youngest reproductive age group and more than 80% in the oldest.

Fertility trends from 1960 to 1980 can be analyzed for each study area from 1970 and 1980 census data. Results based on Rele's (1976) technique and assumed life expectancies of women at birth of 60 and 65 years are shown in Table 9. These comparative results from birth-history data gathered in the Chiang Mai Fertility Survey and from census data should be viewed with caution. The periods used for the comparisons are not exactly the same And the defined populations are different; the birth-history data were obtained from village populations within 50 km of district towns, whereas the census data were drawn from the entire population.

Nevertheless, the two sources yielded similar estimates that signify a rapid decline of fertility from high to low levels in all study areas. The estimates based on census data yielded lower fertility levels throughout the period from 1960–65 to 1970–75, in conformity with generally lower estimates obtained when the reversal technique is used. For the last period (1975–80), however, the census data produced slightly higher fertility values than the birth-history data for Chiang Mai City and the periurban areas. Similar differences were more pronounced in the rural and remote rural areas, possibly because the census data were drawn from areas beyond 50

Table 8. Total fertility at exact ages among women in each five-year period from 1954–58 to 1974–78, by study area

Residence and exact age	1974–78	1969–73	1964–68	1959–63	1954–58
Chiang Mai City					
29	0.81	1.11	1.65	2.02	2.70
34	1.20	1.70	2.43	3.22	4.05
39	1.43	2.07	3.06	4.22	5.27
44	1.57	2.33	3.50	3.79	
49	1.59	2.41	3.60		
Periurban areas					
29	0.94	1.45	2.09	2.59	2.66
34	1.29	2.04	3.09	4.04	3.43
39	1.58	2.46	4.02	5.26	5.38
44	1.73	2.77	4.70	6.05	
49	1.76	2.88	4.92		
Rural areas					
29	1.22	1.97	2.32	3.10	3.13
34	1.48	2.52	3.43	4.38	4.83
39	1.77	2.99	4.26	5.62	6.01
44	1.93	3.40	5.02	6.27	
49	1.99	3.57	5.26		
Remote rural areas					
29	1.10	2.20	2.19	2.88	3.05
34	1.53	3.11	3.19	4.12	4.66
39	1.87	3.51	4.20	5.33	5.94
44	2.01	4.04	4.79	6.05	
49	2.06	4.16	5.01		
All rural areas					
29	1.05	1.71	2.16	2.77	2.85
34	1.38	2.34	3.19	4.15	4.43
39	1.68	2.77	4.11	5.36	5.64
44	1.83	3.14	4.80	6.12	
49	1.87	3.27	5.03		

km from district towns and were likely to include hilltribe people. Hilltribe populations usually have higher fertilitiy than the lowland populations.

Cohort analysis

Thus far we have been considering period analysis, which focuses on events affecting different groups at particular times. In contrast, cohort analysis considers the experience of one group of people over time. Data gathered

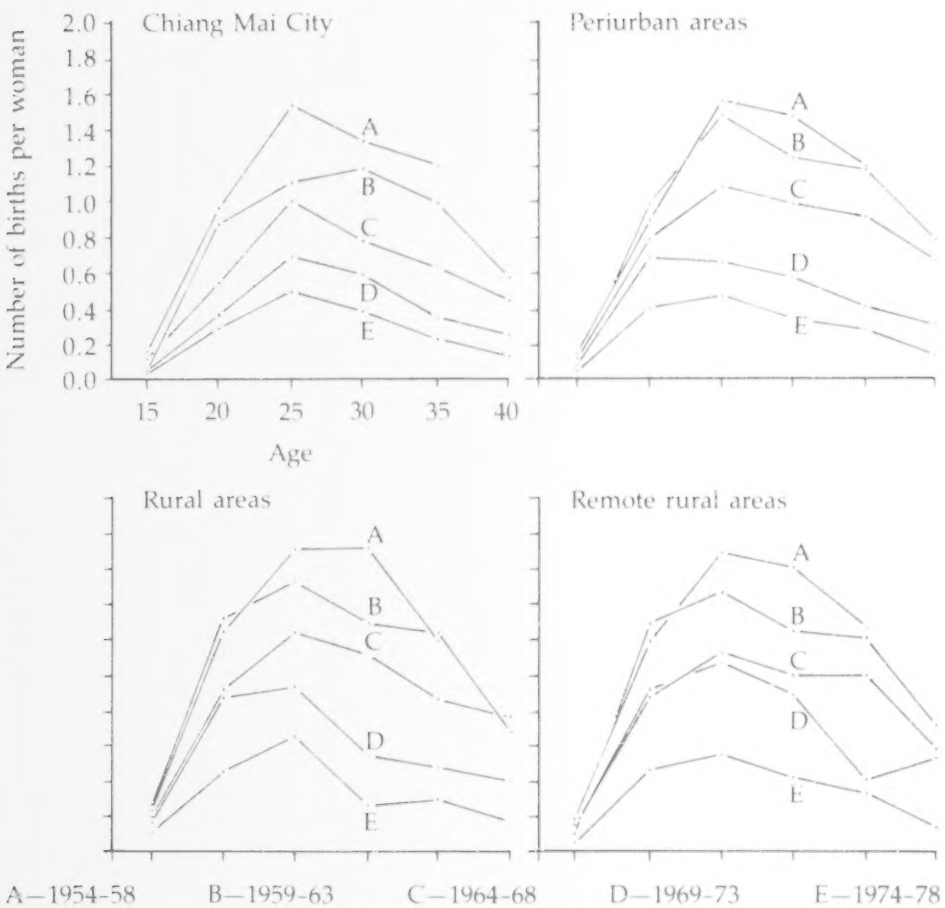


Figure 2. Fertility levels of the Chiang Mai population from 1954-58 to 1974-78, by study area

from different cohorts interviewed in the Chiang Mai Fertility Survey (Table 10) are of interest for a number of reasons.

The first and most striking is the dramatic decline in fertility observed in every successive cohort among women who were currently of reproductive age regardless of study area.

Second, fertility in every age group continued to fall even though it had already reached low levels. As a result, actual fertility of women in the most active reproductive ages was now very low. In Chiang Mai City, for example, by ages 30-34, eligible women had only 1.6 children. If this trend were to continue, it is unlikely that they would have enough children to replace themselves. This is also true for younger women in the other three study areas.

Table 9. Fertility estimates for 1960–80 based on 1970 and 1980 census data (with two assumptions of life expectancy) and on birth-history data from the Chiang Mai Fertility Survey, by study area

Source, assumption, and period	Total fertility			
	Chiang Mai City	Periurban areas	Rural areas	Remote rural areas
Census data (e^0 = 60)				
1960–65	4.5	5.9	6.0	6.4
1965–70	2.7	3.5	4.4	4.8
1970–75	2.2	2.3	3.4	3.3
1975–80	1.8	2.0	2.6	2.5
Census data (e^0 = 65)				
1960–65	4.4	5.7	5.8	6.2
1965–70	2.6	3.4	4.3	4.7
1970–75	2.1	2.3	3.3	3.2
1975–80	1.7	1.9	2.5	2.4
Birth-history data[a]				
1959–63	4.8	6.1	6.3	6.1
1964–68	3.6	4.9	5.3	5.0
1969–73	2.4	2.9	3.6	4.2
1974–78	1.6	1.8	2.0	2.1

a. Total fertility rates (obtained from Table 5) are for age groups up to 45–49 except in the period 1959–63, in which they are for age groups up to 40–44.

Third, fertility decline occurred almost simultaneously among women of different ages in all study areas. In Chiang Mai City, for example, the cohort born in 1934–38 experienced its greatest fertility decline at ages 25–29; for the cohort born in 1939–43, fertility declined most at ages 20–24; and for the younger cohorts, fertility decline took place at younger ages. A similar process took place in other study areas; that is, fertility declined in every age group at almost the same time. The fertility level of the youngest reproductive age group is already low among the cohorts born in 1954–58 or later, both in the city and in the periurban sectors. Fertility trends among young cohorts in the rural and remote rural areas suggest that fertility may reach similarly low levels in the near future.

Fourth, the fertility decline began earlier in Chiang Mai City than elsewhere, with the 1934–38 birth cohort when they were 25–29 years of age. In the remaining three study areas the fertility decline also began with the same cohort, but at ages 30–34 instead of ages 25–29 as in the city, suggesting that the decline in rural areas lagged behind that in Chiang Mai City by approximately five years.

Last, the eldest cohort (born in 1919–23) had significantly lower fertility rates at young ages than did cohorts born in 1924–28 and 1929–33. This was true in Chiang Mai City, the periurban areas, and the rural areas, but not in the remote rural areas. This finding suggests that women in the oldest age groups rounded upward the birth dates of their children born when the women were in their early childbearing years. It may be the result of underreporting of births by some women, especially in the eldest age group. Another factor in these older women's lower fertility may have been World War II. The study found that fertility levels of women who had been ages 15–19, 20–24, and 25–29 during 1944–48 (that is, ages 45–49, 50–54, and 55 or more at the time of the survey) were significantly lower than corresponding rates in 1949–53 and also slightly lower than comparable rates in 1939–43. The postwar baby boom may have occurred in the Chiang Mai population. Evidence from the age structure of the Chiang Mai population indicates that the war did affect fertility in the province.

Evidence from the age structure

If a fertility decline had actually been taking place since the 1960s, as documented by the birth-history data and previous studies already cited, one would expect to find changes in the age structure of the population. Figure 3 presents the age structures for Chiang Mai Province in 1960 and 1970 based on census data, and for Chiang Mai City and rural areas of the province in 1979–80 based on data from the Chiang Mai Fertility Survey. The age structure of Chiang Mai Province's population in 1960 is typical of a population with high fertility, whereas the changes observed in the age structure of 1970 (in age groups 5–9 and 0–4) suggest that birth rates had already begun to fall during the first half of the decade and had fallen more rapidly in the second. In addition, the changes in age structure of the city population in 1980 (age groups 0–4, 5–9, 10–14, and 15–19) demonstrate the continuing rapid decline in fertility into the 1970s. However, for the Chiang Mai rural population—for simplicity of presentation, I have combined the data for the periurban, rural, and remote rural areas—the changes in age structure of the three youngest age groups suggest that fertility began to decline there approximately five years later than in the city but that it fell more rapidly in the 1970s. Therefore, the changes in age structure of the Chiang Mai population since the 1960s confirm the existence of the rapid fertility decline hypothesized from birth histories of women in my sample survey.

Some other interesting evidence is the fluctuation in the 1960 age structure of Chiang Mai Province, notably in age groups 15–19, 20–24, and 25–29. The fluctuations were found again in the 1970 age structure (at ages 25–29, 30–34, and 35–39) and also in the age structures for the Chiang Mai City

Table 10. Mean number of children ever born (per woman) for women born between 1919 and 1963, by study area

Residence and birth cohort	Age group						
	20	20–24	25–29	30–34	35–39	40–44	45–49
Chiang Mai City							
1959–63	0.02						
1954–58	0.04	0.33					
1949–53	0.10	0.46	0.96				
1944–48	0.02	0.55	1.25	1.63			
1939–43	0.16	1.05	2.06	2.66	2.89		
1934–38	0.14	1.11	2.23	2.66	3.38	3.52	
1929–33	0.06	0.95	2.52	3.71	4.34	4.60	4.62
1924–28	0.05	0.53	1.76	3.10	4.11	4.54	4.62
1919–23	0.06	0.77	1.70	2.81	4.04	4.60	4.71
Periurban areas							
1959–63	0.05						
1954–58	0.08	0.49					
1949–53	0.16	0.85	1.34				
1944–48	0.08	0.91	1.59	1.94			
1939–43	0.16	1.17	2.27	2.86	3.15		
1934–38	0.09	1.00	2.51	3.51	3.93	4.07	
1929–33	0.06	0.86	2.45	3.90	4.83	5.14	5.17
1924–28	0.05	0.51	1.85	3.36	4.57	5.25	5.27
1919–23	0.07	0.69	1.77	2.98	4.19	4.99	5.21
Rural areas							
1959–63	0.10						
1954–58	0.16	0.62					
1949–53	0.18	1.05	1.71				
1944–48	0.24	1.16	2.10	2.35			
1939–43	0.18	1.50	2.73	3.28	3.56		
1934–38	0.16	1.40	2.93	4.04	4.51	4.68	
1929–33	0.03	1.11	2.81	4.10	4.94	5.34	5.41
1924–28	0.12	0.87	2.46	4.16	5.39	6.15	6.32
1919–23	0.08	0.64	1.49	2.83	4.00	4.65	4.89
Remote rural areas							
1959–63	0.07						
1954–58	0.19	0.66					
1949–53	0.15	1.07	1.63				
1944–48	0.11	1.00	2.09	2.53			
1939–43	0.19	1.47	2.62	3.53	3.87		
1934–38	0.12	1.28	2.76	3.76	4.16	4.30	
1929–33	0.03	0.89	2.59	3.83	4.85	5.38	5.42
1924–28	0.10	0.85	2.39	4.00	5.21	4.80	5.92
1919–23	0.11	1.28	2.67	4.06	5.33	6.06	6.28

Table 10. *(continued)*

Residence and birth cohort	Age group						
	20	20–24	25–29	30–34	35–39	40–44	45–49
All rural areas							
1959–63	0.07						
1954–58	0.12	0.55					
1949–53	0.16	0.94	1.49				
1944–48	0.13	0.97	1.78	2.12			
1939–43	0.18	1.30	2.44	3.07	3.37		
1934–38	0.11	1.15	2.66	3.69	4.12	4.27	
1929–33	0.05	0.93	2.57	3.95	4.86	5.22	5.27
1924–28	0.08	0.65	2.08	3.66	4.88	5.57	5.70
1919–23	0.07	0.72	1.77	3.02	4.23	4.98	5.21

and the rural populations (at the ages 35–39, 40–44, and 45–49). Since the findings from the three sources of data are so consistent and the age structure of any population is mainly determined by changes in fertility level, all the evidence suggests that Chiang Mai Province experienced a fertility decline during the 1940s. Separation of young men from their wives during the war and food shortages and uncertainty caused by the war are all plausible explanations. A baby boom in the 1950s followed the end of the war.

Another interesting development that can be observed from the age structures for Chiang Mai is the increasing proportion of the population of age 60 or more. The increase could not be observed in 1960 or 1970, when the proportion of elderly persons was 6.0 and 5.8% respectively. But by 1979–80 the elderly population had grown to 7.1% among men and 9.0% among women in Chiang Mai City and 7.9 and 9.0% respectively in the rural areas. The increase was consistent with a decline in fertility during the previous two decades.

CHANGES IN THE MARRIAGE PATTERN

The remarkable decline in fertility over the past two decades in all study areas of Chiang Mai Province could have several explanations. In Chiang Mai, as in other parts of Thailand, childbearing is overwhelmingly confined to marriage or stable unions, and marriage itself signals the beginning of exposure to the risk of pregnancy. Unless marital fertility is controlled in such a society, the age pattern of first marriage, the proportion of persons who marry, and the patterns of marital dissolution and remarriage determine the overall level of fertility. The most important of these deter-

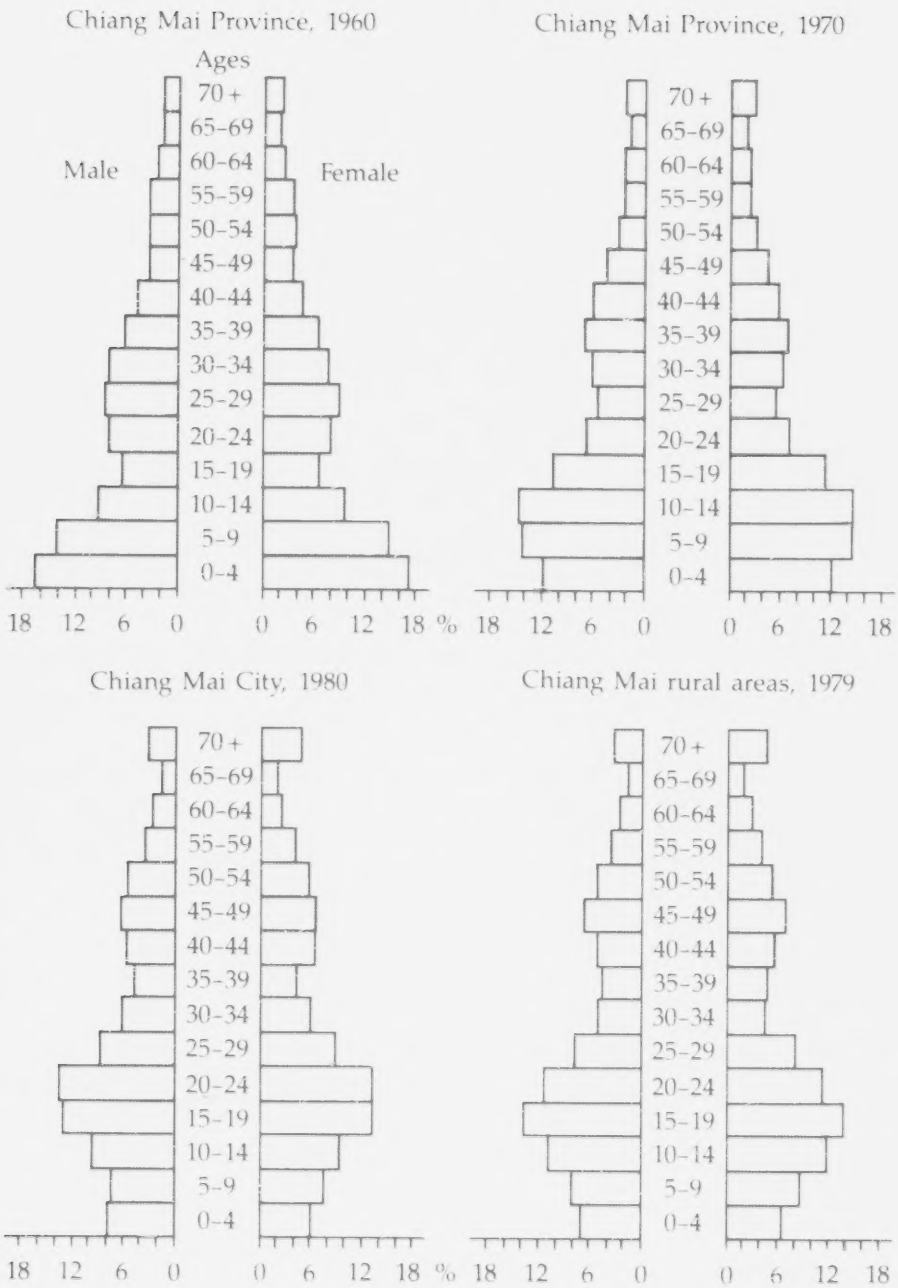
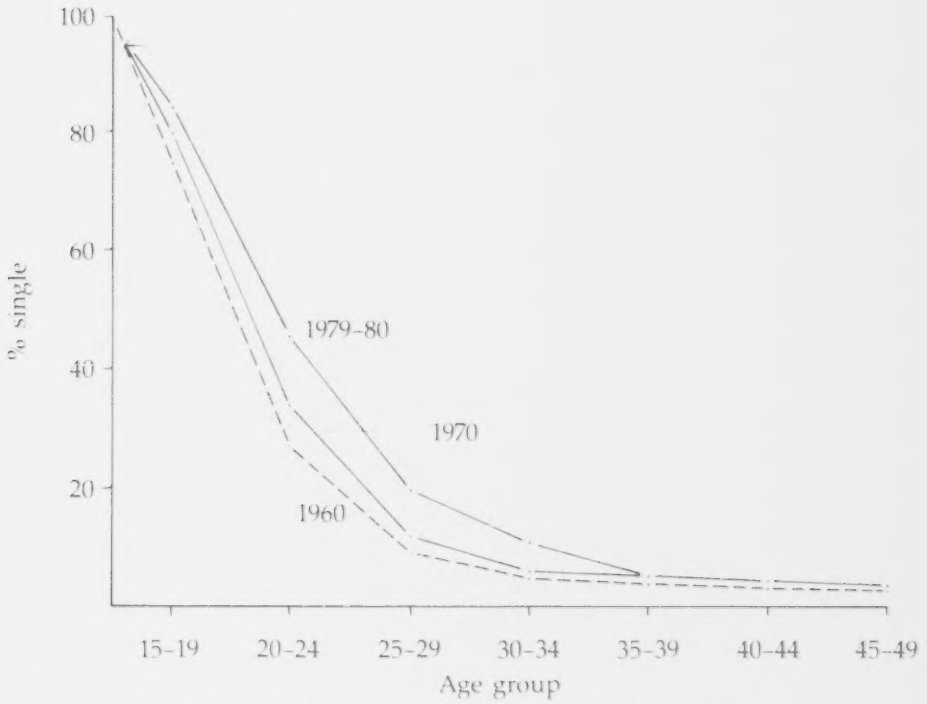


Figure 3. Age structures of Chiang Mai Province (1960 and 1970), Chiang Mai City (1980), and rural areas of Chiang Mai Province (1979)



Sources: 1960 and 1970 censuses; Chiang Mai Fertility Survey.

Figure 4. Percentage of Chiang Mai women single in 1960, 1970, and 1978–80

minants are the age pattern of first marriage and the proportion who ever marry (Trussell 1980). The first factor to consider, then, as an explanation for Chiang Mai's fertility decline is the age pattern of marriage during the period 1960–80.

Evidence of a changing nuptiality pattern for the Chiang Mai population is presented in Figure 4. The marriage data are from the population censuses of 1960 (adjusted for age misreporting [Chamratrithirong 1976]) and 1970, and from the Chiang Mai Fertility Survey of 1979–80. Data for Chiang Mai City were weighted and then combined with those for rural areas. The proportion of single females in Chiang Mai Province was slightly higher in 1970 than in 1960 for all age groups. But the proportion was much greater in 1979–80 than in 1970, especially in the most reproductive age groups: 45.7% for women 20–24 years old, 19.7% among 25–29-year-olds, and 10.3% among women 30–34 (compared with 34.1%, 11.8%, and 5.2% respectively in 1970). The singulate mean age at marriage for women was 20.6 in 1960, 21.2 in 1970, and 23.0 in 1979–80. Thus delay in age at marriage has become more pronounced in the last decade.

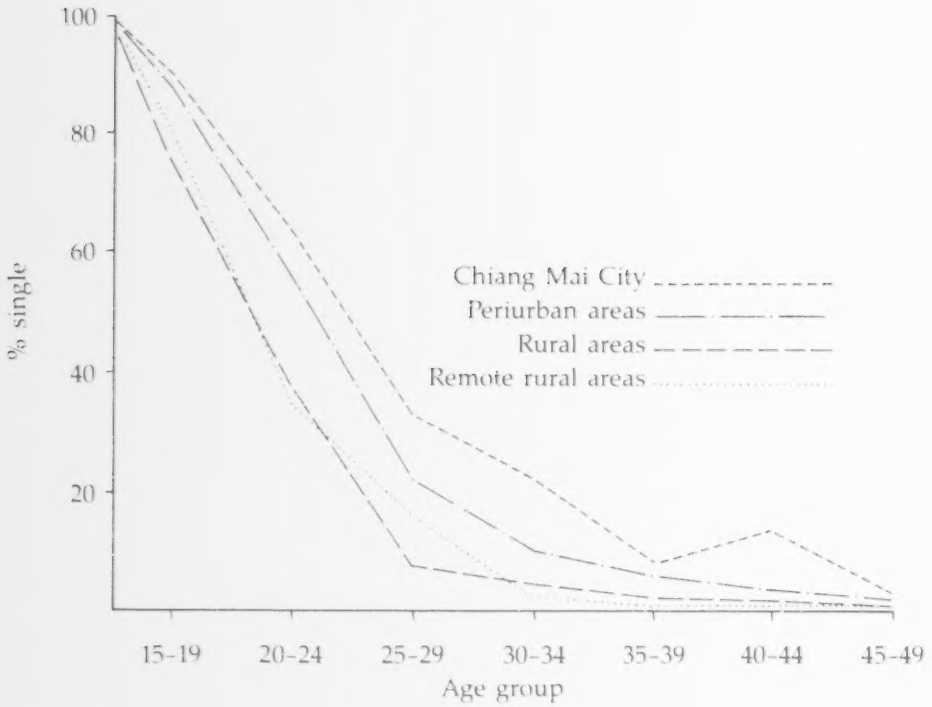


Figure 5. Percentage of Chiang Mai women single, by study area, in 1979–80

Despite the rise in age at marriage during the 1970s for the province's population as a whole, differences among urban and rural areas were pronounced in the most reproductive age groups (Figure 5). In Chiang Mai City in 1979–80 the proportions single were 63.6%, 33.8%, and 22.8% for women 20–24, 25–29, and 30–34 years old respectively. In periurban areas, however, they were 45.8%, 22.0%, and 10.1%; and in rural and remote rural areas combined they were 37.0%, 10.4%, and 3.1%. The singulate mean ages at marriage for women in 1979–80 were 28.0, 23.2, 21.6, and 21.4 years in the city, periurban areas, rural areas, and remote rural areas.

Despite the increasing delay in the age at marriage among Chiang Mai women, in itself it was unlikely to account for more than a small share of the observed fertility decline during the 1960s, although its impact was greater in the following decade. There are several reasons for drawing this inference. First, during the 1960s age at marriage increased only slightly but fertility fell rapidly. Second, despite the large differences in age at marriage between Chiang Mai City and the rural populations in 1979–80, fertility fell below the replacement level in all study areas. Third, as shown in

Table 11, there was no increase in age at marriage among ever married women in different cohorts, but their fertility (i.e., number of live births) nevertheless declined.

Nor did marital dissolution account for the rapid drop in fertility. Although marriage stability played a significant role in fertility differentials, as analyzed from this data set, there was no increase in marital instability between 1960 and 1979–80. Nor was there a significant difference in marriage stability between the city and the rural populations in the late 1970s. Therefore, the impact of marital instability on the rapid decline of fertility in this population is unimportant.

USE OF MODERN CONTRACEPTIVES

With a change in age at marriage ruled out as a major factor in the fertility decline, the next stage of analysis therefore examined the effect of contraceptive use, and specifically Chiang Mai's family planning programs, on fertility.

Knowledge of contraceptive methods was found to be widespread among Chiang Mai women in every age group. Nearly all women knew of a service location, the cost, and a mode of transportation for obtaining modern contraceptive methods such as orals, injectable contraceptives, IUDs, condoms, and male and female sterilization. In addition, more than half of the women surveyed were able to mention the contraceptive methods by name.

The survey also disclosed that high percentages of women living with their husbands were currently practicing contraception in all study areas. Most of the women not practicing contraception were either planning to have a child or believed they were infecund. This high level of contraceptive use explains the low fertility level found in the second half of the 1970s.

Response to questions about contraceptive use in the past revealed that older women in Chiang Mai City had accepted modern contraceptives more readily than those in the rural areas. But the gap between urban and rural women was narrower in the younger age groups. This explains why the fertility decline took place first in Chiang Mai City and later in rural areas. The data also showed that most women had begun to use contraceptives in the 1960s, a period when fertility fell precipitously. A third finding revealed by the data on ever use was that older women began using modern contraceptive methods when they had already had many children, whereas younger women had the advantage of being able to use modern contraception for controlling their fertility to a desired small family size. Data on actual fertility of survey respondents revealed that the only women who had never used contraceptives had had problems of infertility.

These findings are discussed in detail in the following sections.

Table 11. Mean age at first marriage and mean number of live births of Chiang Mai women, by study area and birth cohort, 1919–63

Study area and birth cohort	Number of women	Age at first marriage		Live births	
		Mean	SD	Mean	SD
Chiang Mai City					
1919–23	64	20.5	4.1	5.0	3.1
1924–28	102	21.4	4.5	5.0	3.1
1929–33	135	20.2	3.9	4.8	2.3
1934–38	121	20.4	4.4	4.1	2.3
1939–43	95	20.7	5.0	3.2	2.0
1944–48	89	20.7	3.4	2.2	1.2
1949–53	106	19.8	3.5	1.6	0.9
1954–58	97	19.0	2.4	1.2	0.8
1959–63	30	16.9	1.3	0.5	0.7
All cohorts	841	20.2	4.1	3.3	2.6
Periurban areas					
1919–23	141	20.9	4.4	6.0	3.1
1924–28	201	20.5	3.8	5.9	3.0
1929–33	258	20.2	3.5	5.6	2.7
1934–38	218	19.9	3.6	4.4	2.3
1939–43	192	19.3	3.5	3.5	2.2
1944–48	145	19.9	3.8	2.2	1.4
1949–53	220	19.0	3.5	1.[illegible]	1.0
1954–58	219	18.6	2.1	1.0	0.7
1959–63	62	16.7	1.5	0.6	0.6
All cohorts	1,666	19.6	3.5	3.6	2.9
Rural areas					
1919–23	62	18.8	3.3	5.4	3.0
1924–28	99	18.7	3.3	6.6	3.0
1929–33	121	19.1	3.0	5.6	2.8
1934–38	105	18.6	3.2	4.9	2.6
1939–43	82	18.9	3.1	3.7	1.7
1944–48	74	18.8	3.2	2.5	1.4
1949–53	147	18.8	3.0	1.9	1.2
1954–58	128	18.4	2.2	1.1	0.9
1959–63	65	16.6	1.3	0.5	0.6
All cohorts	885	18.6	3.0	3.6	2.9
Remote rural areas					
1919–23	18	19.6	6.1	7.4	3.3
1924–28	39	20.2	3.2	6.4	3.2
1929–33	63	19.2	2.9	5.8	2.7
1934–38	50	19.4	3.6	4.3	2.5

Table 11. *(continued)*

Study area and birth cohort	Number of women	Age at first marriage		Live births	
		Mean	SD	Mean	SD
Remote rural areas *(continued)*					
1939–43	53	19.1	4.7	3.9	1.8
1944–48	43	19.0	3.9	2.7	1.5
1949–53	57	18.3	2.5	1.1	1.2
1954–58	62	18.2	2.0	1.1	0.8
1959–63	27	16.0	1.6	0.5	0.6
All cohorts	413	18.8	3.5	3.6	2.9
All rural areas					
1919–23	221	20.2	4.4	6.0	3.1
1924–28	339	20.0	3.7	6.1	3.0
1929–33	442	19.8	3.4	5.6	2.8
1934–38	373	19.4	3.6	4.5	2.4
1939–43	327	19.1	3.6	3.6	2.0
1944–48	262	19.4	3.7	2.4	1.4
1949–53	424	18.8	3.2	1.8	1.1
1954–58	409	18.5	2.1	1.0	0.8
1959–63	154	16.6	1.4	0.5	0.6
All cohorts	2,964	19.2	3.4	3.6	2.9

Current contraceptive practice

Use of modern contraceptives by Chiang Mai women at the time of survey was high, especially among women in the age groups of 15–39 (Figure 6). Urban women in the most reproductive age group of 25–29 and in age group 30–39, however, were using contraception at a significantly lower level than nonurban women. The greatest use occurred in different age groups for different areas. For urban women it was ages 20–24 (74.4%); for periurban women, ages 25–29 (81.1%); and for rural and remote rural women, 30–34 (74.6 and 82.4% respectively). Interestingly, among the youngest reproductive age group, highest contraceptive use (74.4%) was in the rural areas.

Women in Chiang Mai City were using contraception differently from women in rural areas in two respects (Table 12). For them orals were the most popular method of contraception regardless of age group. In the rural areas orals were most popular only among women in age groups 15–19 and 25–29; for women in other age groups orals and injectables were used almost equally. Female sterilization was also more popular among young urban women than among their rural counterparts. Nearly a quarter (24.4%) of women between ages 30 and 34 in Chiang Mai City had chosen this per-

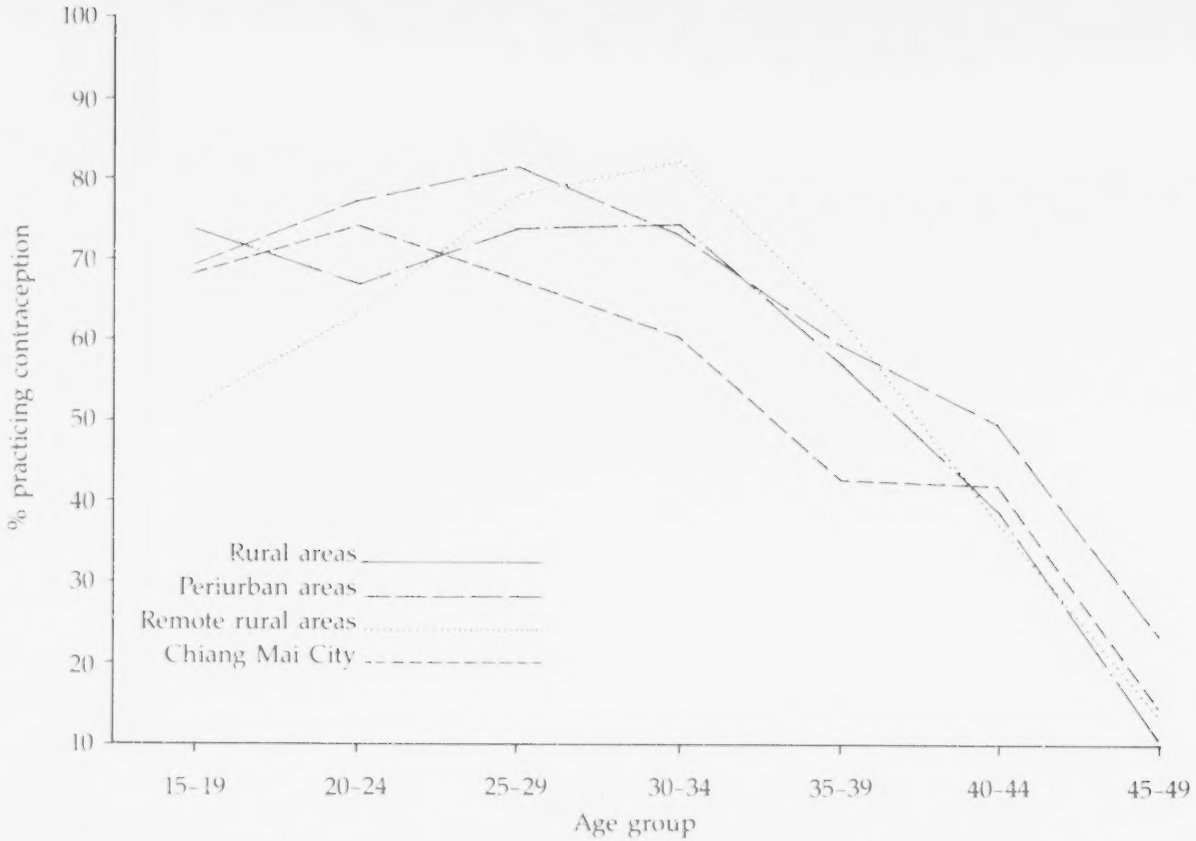


Figure 6. Percentage currently practicing contraception among women living with their husbands and not pregnant at the time of interview, by study area and age

Table 12. Percentage currently practicing contraception among women living with their husbands and not pregnant at time of interview, by study area, contraceptive method, and age

Study area and contraceptive method	All women ages 15–49	% of women by age group as of 1 January 1979						
		15–19	20–24	25–29	30–34	35–39	40–44	45–49
CHIANG MAI CITY								
Practicing contraception	51	69	74	68	60	43	42	15
Orals	18	55	38	25	15	10	10	4
Injectables	8	14	14	18	4	3	4	2
IUDs	3	0	5	5	0	0	5	1
Condom	3	0	4	2	9	4	0	2
Male sterilization	2	0	1	1	1	5	1	2
Female sterilization	14	0	10	16	24	19	17	3
Other methods	3	0	2	0	6	1	5	1
Not practicing contraception	50	27	26	32	40	57	58	85
Total	100	100	100	100	100	100	100	100
ALL RURAL AREAS								
Practicing contraception	58	68	72	78	75	65	45	19
Orals	24	43	34	35	29	22	16	5
Injectables	22	20	30	26	28	28	18	7
IUDs	3	2	2	4	2	2	3	3
Condom	1	1	1	0	1	1	0	0
Male sterilization	1	0	1	1	2	0	1	0
Female sterilization	6	0	3	10	12	10	5	3
Other methods	1	1	0	2	1	2	2	2
Not practicing contraception	42	32	28	22	25	35	55	81
Total	100	100	100	100	100	100	100	100

Note: Percentages may not sum to totals because of rounding.

Table 13. Ever married women who had ever used specified contraceptive methods, by age and study area (%)

Age at interview and and contraceptive method	Chiang Mai City	Peri-urban areas	Rural areas	Remote rural areas
Any method of contraception				
< 20	76	79	76	71
20–24	93	88	82	80
25–29	85	92	87	86
30–34	87	86	86	90
35–39	87	78	75	85
40–44	72	68	63	67
45–49	54	56	34	38
50–54	36	21	13	11
55+	19	7	0	9
Age-standardized rate up to age				
30–34	88	88	85	84
45–49	78	77	70	72
55+	67	64	56	59
Oral contraceptives				
< 20	67	58	65	63
20–24	74	71	72	61
25–29	71	73	76	65
30–34	63	66	72	71
35–39	66	53	60	65
40–44	37	38	46	39
45–49	26	29	21	15
50–54	14	7	7	2
55+	4	2	0	4
Age-standardized rate up to age				
30–34	69	69	73	65
45–49	55	54	57	51
55+	45	43	45	41
Injectable contraceptive				
< 20	5	25	20	8
20–24	31	44	41	42
25–29	47	57	48	53
30–34	34	52	53	49
35–39	28	49	38	38
40–44	15	40	24	39
45–49	10	25	12	10
50–54	7	7	3	0
55+	0	1	0	0

Table 13. *(continued)*

Age at interview and contraceptive method	Chiang Mai City	Peri-urban areas	Rural areas	Remote rural areas
Age-standardized rate up to age				
30–34	36	49	45	46
45–49	26	43	34	37
55+	22	35	27	29
IUD				
<20	0	10	2	0
20–24	13	6	2	5
25–29	10	9	7	14
30–34	7	3	5	13
35–39	6	9	8	6
40–44	10	9	4	9
45–49	3	7	1	4
50–54	3	3	0	0
55+	1	0	0	1
Age-standardized rate up to age				
30–34	10	6	4	10
45–49	8	7	4	8
55+	7	6	3	7

manent contraceptive method, compared with 12.1% in rural areas. (Among women in the 45–49 age group the respective percentages were 3.1 and 2.6.) These higher rates of acceptance among younger women suggest a growing acceptance of female sterilization. However, there seems to have been no increase in the popularity of male sterilization among either urban or rural populations.

Ever users of contraceptives

Analysis of the patterns of use by women who have ever used contraception helps to explain past levels and trends of fertility in Chiang Mai. As Table 13 shows, a higher proportion of urban women in the older age groups had used contraception than had older women in the periurban, rural, and remote rural areas. But marked differences between urban and rural women were found only in the oldest age group (50 or more); the gap was narrower in age groups 35–49 and was almost nonexistent in the most reproductive age groups in every study area. The age-standardized rate of use up to age group 30–34 was 87.6, 88.3, 84.5, and 83.9% for the city, periurban, rural,

and remote rural areas respectively. In the most fertile age group (25–29) more than 85% of women in all areas had already used a modern form of contraception.

Methods of contraception used

Women in Chiang Mai Province had used many methods of contraception, including orals, injectables, IUDs, female sterilization, and condoms (Table 13). But the most popular methods were the orals and the injectables.

Although a greater percentage of women had used orals than injectables, it is not possible to assert with certainty that oral contraception was the most popular method, for several reasons: (1) oral contraceptives were available both in the McCormick Hospital's family planning program and through the government's health network, whereas until about 1976 the injectable was available only through the McCormick program; (2) orals had been available to nearly all women since 1967 through the McCormick Hospital's program and before then through chemist shops, but during the study period the injectables were available only for women who had had a previous pregnancy; and (3) few women had been satisfied with only one contraceptive method, and switching from one method to another was common in this population.

It is noteworthy that more rural than urban women chose the injectables, even though urban women had easier access to family planning services. It might be that injectables are more suited to rural life than the orals.

Although the McCormick program had introduced the IUD in 1963 and most people knew about this method, not many of them chose this method for family planning after 1967. This was also the case with other methods, such as condoms, male and female sterilizations, and withdrawal.

Age patterns of first use

Knowing when modern contraception first began to be used is crucial to an understanding of the fertility decline in this population. The questionnaire used in the Chiang Mai Fertility Survey elicited information about when (at what age and birth order) women began using each contraceptive method. Because the patterns of fertility decline are remarkably similar in the periurban, rural, and remote rural areas, for simplicity of presentation the data for those areas are combined. Tables 14 and 15 compare the patterns of first use for orals and the injectable contraceptive (Depo Provera) by women in rural areas and the city of Chiang Mai. Owing to much lower acceptance levels of other contraceptive methods, similar information for them is not available.

Chiang Mai's first family planning program started in 1963 with IUDs (the Margulies Coil). The program began offering the injectable contracep-

Table 14. Women in rural areas who had ever used orals or injectables, by age at interview and year when specified method was first used (%)

Method used and age at interview	Number of women	Year of first use						
		1954–58	1959–63	1964–68	1969–73	1974–78	1979	1954–79
Orals	1,308							
< 20	80	0	0	0	0	70	30	100
20–24	275	0	0	0	12	80	7	100
25–29	308	0	0	2	41	53	3	100
30–34	192	0	3	15	49	32	1	100
35–39	175	1	4	33	37	23	2	100
40–44	148	1	7	35	35	22	1	100
45–49	103	1	10	39	37	12	2	100
50–54	23	13	4	44	30	4	4	100
55+	4	0	25	0	25	50	0	100
Injectables	936							
< 20	26	0	0	0	0	73	27	100
20–24	170	0	0	0	5	80	15	100
25–29	227	0	0	1	36	60	3	100
30–34	144	0	0	10	51	37	1	100
35–39	139	1	3	19	41	35	1	100
40–44	129	1	7	24	36	30	0	100
45–49	82	1	4	19	40	34	1	100
50–54	18	0	6	44	33	17	0	100
55+	1	0	0	0	100	0	0	100

Note: Percentages may not sum to totals because of rounding.

Table 15. Women in Chiang Mai City who had ever used orals or injectables, by age at interview and year when specified method was first used (%)

Method used and age at interview	Number of women	Year of first use						
		1954–58	1959–63	1964–68	1969–73	1974–78	1979–80	1954–80
Orals	361							
<20	14	0	0	0	0	50	50	100
20–24	61	0	0	0	3	80	16	100
25–29	76	0	0	4	36	50	11	100
30–34	58	0	2	14	57	24	3	100
35–39	52	0	4	44	40	10	2	100
40–44	46	0	4	50	30	11	4	100
45–49	35	9	14	46	26	6	0	100
50–54	16	0	13	31	44	13	0	100
55+	3	0	0	100	0	0	0	100
Injectables	172							
<20	1	0	0	0	0	100	0	100
20–24	26	0	0	0	0	61	38	100
25–29	50	0	0	0	30	58	12	100
30–34	32	0	0	16	44	31	9	100
35–39	22	0	5	23	64	9	0	100
40–44	19	0	10	26	47	16	0	100
45–49	14	0	14	43	29	14	0	100
50–54	8	0	0	50	25	25	0	100
55+	0	0	0	0	0	0	0	100

Note: Percentages may not sum to totals because of rounding.

tive in 1965 and the pill in 1967. Orals could be obtained from chemist shops and certain hospitals in Chiang Mai City in the early 1960s, but at high cost, and therefore they were not immediately furnished in the family planning program. It is therefore quite surprising (Table 14) that some rural women reported that they began using orals and injectables as early as the mid-1950s, long before the start of the family planning program.

More than one-third of the women who had begun using orals in 1964–68 were 35 years of age or older at the time of the survey. That means they would have been in the broad age group of 25–44 at the time they first accepted orals. The data also show that in more recent years higher percentages of contraceptive users accepted the pill in the younger reproductive age groups. For example, 67.2% of acceptors who were 30–34 at the time of the survey had already accepted the pill at ages 25–29 or less; this proportion was 96.7% among acceptors 25–29 years old at the time they were interviewed. Nearly the same percentage was found among women in the youngest age group.

The acceptance pattern for the injectable contraceptive was similar to that for the pill. The exception is that a smaller proportion of women accepted the injectable than accepted orals during 1964–68. That proportion increased in 1969–73 and in 1974–78. The McCormick Hospital's introduction of a mobile family planning unit into rural populations in 1969 may have made the injectable more accessible to rural women and thereby increased its acceptance rate in the later periods.

The acceptance pattern for the Chiang Mai City population (Table 15) is similar to that of the rural population, except that a higher proportion of contraceptive acceptors in every age group chose the pill or the injectable in the earlier periods—i.e., 1959–63 and 1964–68. The proportions of acceptors of each method were much the same as in the rural group in 1969–73.

Parity levels at first use

Women of age 40 or more at the time of the survey would have been 25 or more when the first family planning program was established in Chiang Mai City. By age 25 they would have already borne some children. Analysis of the data on acceptance of oral and injectable contraceptives by birth order at time of first acceptance for women in rural areas (Table 16) reveals the following. First, rural women who were 40 years old or more at the time of survey had begun using the pill when they already had many children: 56.1% of women interviewed at ages 40–44 had had five or more births at the time of acceptance. This percentage was even greater among older women. Second, most younger rural women, in contrast, had begun using the pill at much lower parities: 69.8% of those interviewed at ages 30–34

Table 16. Women in rural areas who had ever used orals or injectables, by age at interview and birth order when specified method was first used (%)

Method used and age at interview	Number of women	Birth order						
		0	1	2	3	4	5+	All birth orders
Orals	1,308							
< 20	80	86	14	0	0	0	0	100
20–24	275	59	34	6	0	0	0	100
25–29	308	24	40	23	11	1	2	100
30–34	192	16	27	28	18	8	4	100
35–39	175	0	10	25	25	19	21	100
40–44	148	1	3	12	13	15	56	100
45–49	103	0	4	7	11	13	66	100
50–54	23	0	0	0	4	17	78	100
55+	4	0	0	0	25	0	75	100
Injectables	936							
< 20	26	8	92	0	0	0	0	100
20–24	170	5	83	9	2	1	0	100
25–29	227	1	59	25	13	2	0	100
30–34	144	2	41	33	15	6	4	100
35–39	139	1	12	22	22	19	24	100
40–44	129	0	3	13	15	16	53	100
45–49	82	0	1	10	12	10	67	100
50–54	18	0	0	0	6	0	94	100
55+	1	0	0	0	100	0	0	100

Note: Percentages may not sum to totals because of rounding.

had accepted the pill when they had only two or fewer children, and the proportions of such early acceptors were 86.4 and 99.6% among women interviewed at ages 25–29 and 20–24 respectively. It is noteworthy that well over half (59.3%) of women in the 20–24 age group had started using the pill before their first birth, and in the youngest age group (under 20) the proportion was 86.3%. Third, the acceptance pattern for the injectable contraceptive among rural women was much the same as that for the pill. The policy of the Chiang Mai family planning program did not allow women who had not borne any children to use the injectable. Nevertheless, a few respondents reported having used this method before their first birth.

Most of the younger women started using the injectable immediately after their first birth. Among women interviewed at ages 25–29 the proportion who did so was 58.6%; among women who were only 20–24 and 15–19 at the time of the survey the proportions were 82.9 and 92.0% respectively.

The acceptance pattern among urban women was the same as in the rural population (Table 17). Because of the lower fertility of urban women, however, the majority of older women (age 40 or more) had begun using orals or injectables after having four or more children, instead of five or more as was the case for the rural population.

An interesting finding is that no difference emerged between the urban and rural populations in the pattern of pill and injectable acceptance by women in the most reproductive age group. In both populations more than 85% of young women accepted the pill before their first birth, and more than 80% accepted the injectable immediately after their first child was born.

Sources of modern contraceptives

The study found that women in Chiang Mai accepting contraceptives did so mainly from government health facilities and from the McCormick family planning program. The other main source was the private sector, principally private clinics and chemist shops. The pattern of acceptance depended not only on the type of contraceptive offered but also on the services provided.

As shown in Table 18, most of the nonurban pill acceptors (70% of periurban, 69.6% of rural, and 58.5% of remote rural women) received their supplies from government health outlets such as hospitals, health centers, and health personnel working at home. In Chiang Mai City, however, only 41.6% received their pills from government services.

Although significantly fewer women obtained their pills from the McCormick family planning programs (including its mobile unit, the city clinic, and the hospital) than from governmental outlets, the pattern of acceptance by them is interesting. The McCormick program's clinic and hosp-

Table 17. Women in Chiang Mai City who had ever used orals or injectables, by age at interview and birth order when specified method was first used (%)

Method used and age at interview	Number of women	Birth order						
		0	1	2	3	4	5+	All birth orders
Orals	361							
< 20	14	86	14	0	0	0	0	100
20–24	61	57	43	0	0	0	0	100
25–29	76	33	41	25	0	1	0	100
30–34	58	19	41	26	10	3	0	100
35–39	52	0	25	42	15	6	12	100
40–44	46	4	6	17	17	20	35	100
45–49	35	0	9	9	14	23	46	100
50–54	16	0	6	0	13	0	81	100
55 +	3	0	0	0	0	33	67	100
Injectables	172							
< 20	1	0	100	0	0	0	0	100
20–24	26	0	96	4	0	0	0	100
25–29	50	6	52	34	8	0	0	100
30–34	32	0	43	34	22	0	0	100
35–39	22	0	18	41	18	9	14	100
40–44	19	0	11	21	21	10	37	100
45–49	14	0	7	14	0	21	57	100
50–54	8	0	12	0	0	13	75	100

Note: Percentages may not sum to totals because of rounding.

tal, which are situated in the city, naturally attracted acceptors living in the city and the periurban areas (21.0 and 12.3% of all pill acceptors from those respective areas) but few from rural and remote rural areas. The McCormick program's mobile unit, however, was used by 16.3% of orals acceptors in remote rural areas and by 8.2% of orals users in rural areas but by few women in the city or periurban areas as a source of orals.

Other private sources, including chemists and private clinics, played a significant role in the delivery of orals. Their contribution was greatest in the city (37.3%) and lowest in the periurban areas (16.4%).

Most injectable acceptors received their injections through the McCormick family planning program. The proportion of acceptors using the McCormick program was highest in the periurban areas (83.2%) and lowest in the rural areas (68.8%). Reliance on the mobile unit bore a direct relationship with distance from Chiang Mai City, the percentages ranging from 1.4 in Chiang Mai City to 76.7 in remote rural areas.

Facilities for sterilization and for IUD insertion have been available mostly in hospitals or in first-class government health centers. Thus urban residents have had more access to them than the rural populations. Acceptance of these two methods was still very low, even in Chiang Mai City, at the time of the survey.

The simplest contraceptive technique, the condom, is easily available from various sources. The majority of users surveyed bought them from chemist shops.

The data presented in this section have indicated that the availability of various contraceptive methods through Chiang Mai's family planning programs has played a significant role in the widespread acceptance of modern contraceptive methods. Different services have reached different areas. The city clinics have served mainly women from the urban and periurban areas; the mobile family planning unit has served mostly women from rural and remote rural areas; and government health posts scattered more or less evenly in periurban, rural, and remote rural areas have dispersed oral contraceptives to women outside metropolitan Chiang Mai.

Factors in nonacceptance

Despite the popularity of family planning in Chiang Mai, 10% of ever married women in the most reproductive age groups had not become acceptors at the time of the survey. The question therefore arises, why haven't such women used contraception for controlling their fertility? A comparison of the fertility levels of noncontraceptors with those of women who had ever used contraception (Table 19) reveals that in both urban and rural populations noncontraceptors had borne fewer children than contraceptive users in all age groups, a finding that suggests high-fertility women

Table 18. Contraceptive acceptors, by study area, source of supplies, and first method used (%)

Study area and source	First method used						
	Oral	Injectable	IUD	Condom	Sterilization	Others	All methods
CHIANG MAI CITY							
Government							
Health centers or hospitals	42	18	56	15	51	11	34
Health personnel	0	0	6	0	0	1	0
McCormick							
Mobile unit	0	1	0	0	0	0	0
City clinic	16	47	0	5	0	2	15
Hospital	5	26	31	2	48	6	14
Chemists	30	1	0	60	0	11	21
Private clinics	7	7	6	0	1	1	5
Others	1	0	0	15	0	64	9
Unknown	0	0	0	3	0	5	1
All sources	100	100	100	100	100	100	100
Number of acceptors	281	74	16	40	75	66	552
PERIURBAN AREAS							
Government							
Health centers or hospitals	68	14	33	27	51	4	45
Health personnel	0	0	0	0	5	0	0
McCormick							
Mobile unit	3	17	0	0	0	0	6
City clinic	10	51	4	0	3	0	20
Hospital	3	15	45	0	36	4	10
Chemists	12	0	0	36	0	12	8
Private clinics	3	2	16	0	5	0	3
Others	2	0	0	27	0	67	6
Unknown	0	0	1	9	0	13	1
All sources	100	100	100	100	100	100	100
Number of acceptors	563	290	69	11	39	82	1,054

RURAL AREAS							
Government							
Health centers or hospitals	68	25	45	43	75	7	53
Health personnel	2	1	0	0	0	0	1
McCormick							
Mobile unit	8	51	0	0	0	2	16
City clinic	2	17	0	0	0	2	5
Hospital	0	1	5	0	17	0	1
Chemists	17	2	0	57	0	18	13
Private clinics	1	1	40	0	8	2	3
Others	3	3	10	0	0	61	8
Unknown	0	0	0	0	0	7	1
All sources	100	100	100	100	100	100	100
Number of acceptors	329	106	20	7	12	44	518
REMOTE RURAL AREAS							
Government							
Health centers or hospitals	57	8	54	14	75	4	39
Health personnel	1	8	0	0	0	4	3
McCormick							
Mobile unit	16	77	0	0	0	0	27
City clinic	1	2	0	0	0	0	1
Hospital	1	2	27	0	13	0	2
Chemists	19	0	0	71	0	27	16
Private clinics	1	2	18	0	12	4	3
Others	3	2	0	0	0	57	8
Unknown	1	0	0	14	0	4	8
All sources	100	100	100	100	100	100	100
Number of acceptors	147	60	11	7	8	28	261

Notes: Percentages may not sum to totals because of rounding. The McCormick Hospital's mobile unit covers 38 work points in rural areas of the province every three months.

Table 19. Mean number of children ever born to contraceptive users and nonusers in Chiang Mai City and rural areas, by age

Age at interview	Mean number of children				% of ever married women			
	Chiang Mai City		All rural areas		Chiang Mai City		All rural areas	
	Users	Nonusers	Users	Nonusers	Users	Nonusers	Users	Nonusers
15–19	0.44	0.00	0.54	0.32	76	24	76	24
20–24	1.17	0.40	1.01	0.81	94	6	85	15
25–29	1.73	0.38	1.85	0.80	85	15	91	10
30–34	2.18	0.60	2.49	1.15	89	11	88	12
35–39	3.30	1.13	3.71	2.45	90	10	82	18
40–44	4.14	2.30	4.77	3.71	76	24	70	30
45–49	4.88	4.24	5.87	5.09	59	41	50	50
50–54	5.47	4.61	6.87	5.95	43	57	19	81
55+	6.26	4.77	6.63	5.96	19	84	7	93

Note: Some percentages of ever married women in this table are higher than those in Table 13 because the analysis here includes women who used abortion to control their fertility, whereas such women are omitted from the analysis in Table 13.

seek modern contraception early in their reproductive lives. The data also show that fertility was substantially lower among nonusers than among users in the high-fertility age groups of 15–34, although low proportions of those women, especially those 20–34, had not used contraception. These findings suggest that low fertility occurred naturally for these women. The higher proportion of nonusers in the age group 15–19, however, may be explained by the fact that most of them had not yet conceived. This was clearly the case among young urban nonusers. It seems reasonable, therefore, to conclude that those who did not practice contraception during the 1970s were mostly women of low fecundity.

FACTORS IN CHIANG MAI'S RAPID FERTILITY DECLINE

The fertility decline in Chiang Mai has resulted mainly from the desire for small families, itself the consequence of important socioeconomic changes that began long before the 1960s. These can be summarized as follows. The most important change was the limitation of available land. Another was rapid decline in child mortality after World War II, which brought about more and more pressure on couples to have fewer children. The government's development schemes in the 1960s did not create new jobs and therefore did not help unemployed people. Small family size thus became a new value for survival. Finally, contraceptive services made available through private and government family planning programs since the 1960s helped couples achieve desired small family size.

Evidence of population pressure on the land comes from families who have no land for cultivation. At the time of the Chiang Mai Fertility Survey in 1979 only 50.4% of households in the periurban areas, 57.6% of those in the rural areas, and 55.6% in the remote rural areas worked on their own land. Others had to rent all or part of the farm land they used to earn their livelihood.

Dr. Boonchom Areewongse, director of the McCormick family planning program, who was 72 years of age in 1985 and a native of Chiang Mai, described to me how, in the 1930s, people moved from Chiang Mai Province to nearby Chiang Rai Province in search of land. In the 1960s there was again an exodus of people from Chiang Mai City and the periurban areas to rural and the remote rural areas of the province for the purpose of acquiring new land.

Pressures on land have also been exacerbated by the inheritance system. Land is divided among the children of a family after their parents die. Without new land becoming available, the consequence of this system is that, after a few generations, the individual land holdings become too small to support a family.

The continuing mortality decline put more pressure on the land tenure system. After World War II infant and child mortality fell rapidly, owing to the eradication or control of malaria, smallpox, cholera, and tuberculosis; and more children survived to lay claim to their parents' land. The vital registration system for Chiang Mai Province recorded crude death rates of 16.2 deaths per 1,000 persons in 1947, 10.2 in 1963, and 6.2 in 1978. The decline of infant mortality was also remarkable: from 130.8 deaths per 1,000 live births in 1947 to 68.7 in 1963 and 20.8 in 1978. Although the vital events recorded by the vital registration system are well known to be underreported, the estimates point unmistakably to a mortality decline in this population.

Job opportunities for the unemployed have been limited in the agricultural sector. Even in the early 1960s, the employment opportunities for people without higher education were slim, and in recent years they have worsened. It is now common for there to be from ten to 100 applicants for any job opening. The plight of young women from Chiang Mai and other northern provinces who seek demeaning jobs as bar girls in Bangkok and other big cities is well known.

During the survey interviews many of the elderly women described the hardship that having too many children had caused. Some of them had resorted to induced abortions out of desperation. Many said that if modern contraceptives had been available in their day, they certainly would have had smaller families.

The desire for improved living levels—e.g., higher education for their children and for household conveniences—has increased the attractiveness of small family size. In Chiang Mai Province, as in other parts of Thailand, only people with higher education are able to find jobs in the government sector. But until the 1960s centers of higher education existed only in Bangkok, the capital city. A few other cities had schools at the preuniversity level, but opportunities for higher education were not available to people in rural areas, who were generally unable to afford the expense.

Not until the 1970s were people in Chiang Mai Province exposed to such forms of modernization as cars, motorcycles, and television. This came after the substantial decline in fertility of the 1960s. The attractions of consumer goods may have served as further motivation to limit family size. Buying a motorcycle, for example, instead of having another child could help a couple to earn their living.

Modern contraceptives, made available first by the McCormick family planning program in 1963 and later by the government programs, helped young couples to achieve the small families they desired, as well as helping older couples to limit their family size to levels already achieved. Fertil-

ity, therefore, began falling precipitously in the 1960s and continued to decline thereafter, to reach a level lower than replacement.

One reason for the widespread acceptance of modern contraception in so short a period of time may have been people's trust in the McCormick program. For almost a decade before the family planning was started the people of Chiang Mai had received health services from the McCormick Hospital. The contraceptive services offered by McCormick found ready acceptance.

DISCUSSION

Findings from the Chiang Mai Fertility Survey support findings from previous studies (Pardthaisong 1978; Shevasunt et al. 1978) and provide firm evidence of the impressive impact of family planning programs on family size in Chiang Mai Province, where fertility fell from a high level to below the replacement level in less than twenty years. The most striking finding was the rapidity of the fertility decline in rural areas. There it started in the late 1960s at a level higher than that of the Chiang Mai urban population. By the late 1970s rural fertility had reached such a low level that it nearly equaled the rate prevailing in Chiang Mai City.

Even today, differences between the urban and rural populations in "modernity"—e.g., educational level, electrification, water supply, home appliances, medical services, occupation, and general socioeconomic status—are dramatic. Modernity has been demonstrated to be the main cause of fertility differentials in many populations elsewhere. It is therefore amazing that, in less than twenty years since the introduction of an intensive family planning program, the fertility differentials have almost disappeared between Chiang Mai Province's rural and urban populations. The survey data also indicate an identical fertility decline among women of all sectors, regardless of their educational levels and spouses' occupations. These findings strongly suggest that family planning services are one of the best possible means of slowing population growth to a desired low level.

As already noted, Chiang Mai's rapid fertility decline between 1960 and 1970 did not coincide with a change in the marriage pattern. Singulate mean age at marriage did increase in the 1970s, however, especially in Chiang Mai City, where modern contraceptives had been in common use. The survey data suggest that the marriage age of women did not start to rise until after contraceptives had been available for many years. Thus, this study provides a different perspective from what has been shown in other societies, namely that in Chiang Mai marital fertility fell before age at marriage rose. Moreover, marital stability was much the same throughout the study period of 1960–80.

The rapid fall of fertility in Chiang Mai involves not only a change in the age structure of the population but also a change in socioeconomic patterns, for example in the primary school system. At present many primary schools register fewer than sixty pupils in grades 1 through 6, and others have been forced to close because of an insufficient number of pupils. Middle-class families have recently experienced a scarcity of servants, which is attributable partly to the expansion of the job market and partly to the reduction in the number of children born in Chiang Mai starting in the 1960s. The introduction of family planning services in Chiang Mai Province has also enhanced couples' reproductive control and thus improved their human rights situation.

The fertility decline in Chiang Mai Province has been more rapid than in other parts of Thailand because of the early introduction of family planning services and the intensiveness of the family planning programs there. Nevertheless, other parts of Thailand began to experience fertility declines in the 1960s (Pardthaisong 1980), and these became more rapid in the 1970s (Thailand, Office of the Prime Minister 1977). Diminishing regional differentials in Thailand's fertility levels have been documented by Kamnuansilpa et al. (1982).

Comparison of the fertility decline in Chiang Mai with that of Thailand as a whole raises some interesting questions. Will the fertility differentials among the regions of Thailand disappear in the near future? Will the fertility of the urban populations be the same as the rural populations', as is now the case in Chiang Mai? Is it possible for Thailand as a whole to attain the same low levels of fertility now seen in Chiang Mai?

It seems to me that if family planning services like those in Chiang Mai become available throughout Thailand, a further reduction in fertility is possible at the national level. But differences among regions such as culture, land-tenure patterns, and geography make an equally low fertility level in all parts of the Kingdom unlikely. For example, the scarcity of water in the northeast necessitates more intensive use of labor than in the north; typically, villagers must carry water in buckets from sources more than a kilometer away, whereas in rural Chiang Mai the source of water is almost at one's doorstep. It follows that a child's contribution to the labor force is more important for the villagers in the northeast. This need for children's labor apparently affects the fertility level of the region. Such differences in the lives of the people in the north and the northeast go beyond what family planning can do and make it difficult to believe that the two populations will ever have equally low fertility levels.

REFERENCES

Brass, William, and Hoda Rashad

1980 Exploratory demographic analysis of imperfect maternity histories to determine levels and trends of fertility. Paper presented at Seminar on the Analysis of Maternity Histories, International Union for the Scientific Study of Population, London, 9–11 April.

Chamratrithirong, Aphichat

1976 Fertility, nuptiality and migration in Thailand, 1970 Census: The multiphasic response theory. Unpublished Ph.D. dissertation, Department of Sociology, Brown University, Providence, Rhode Island.

Chiang Mai University and University of Chicago

1979 *Fertility and Family Planning in Rural Northern Thailand.* Chicago: University of Chicago.

Kamnuansilpa, Peerasit, Apichat Chamratrithirong, and John Knodel

1982 *Thailand's Continuing Reproductive Revolution: An Update.* Research Report 82-19. Ann Arbor: Population Studies Center, University of Michigan.

McDaniel, Edwin B., and Tieng Pardthaisong

1973 *Evaluating the Effectiveness of a Two-Year Family Planning Action Program at Ban Pong Village in Northern Thailand.* Bangkok: Institute of Population Studies, Chulalongkorn University.

Pardthaisong, Tieng

1980 *Family Planning Programmes and the Decline of Fertility in the 71 Provinces of Thailand.* Monograph No. 13. Bangkok: Thai Khadi Research Institute.

1978 *The Recent Fertility Decline in the Chiang Mai Area of Thailand.* Papers of the East-West Population Institute, No. 47. Honolulu: East-West Center.

Rele, J.R.

1976 *Fertility Analysis Through Extension of Stable Population Concepts.* Westport, CN: Greenwood Press. (First published as Population Monograph Series, No. 2. Berkeley: University of California, 1967.)

Shevasunt, Somphong, Dennis P. Hogan, and Kwanchai Thaitong

1978 Fertility and family planning in rural northern Thailand. *Studies in Family Planning* 9(8):212–21.

Thailand, Office of the Prime Minister, National Statistical Office

1977 *The Report of the Survey of Population Change 1974–1975.* Bangkok.

Trussell, James

1980 Illustrative analysis: Age at first marriage in Sri Lanka and Thailand. *World Fertility Survey: Scientific Report No. 13.* London: World Fertility Survey.

RECENT AVAILABLE PAPERS OF THE EAST-WEST POPULATION INSTITUTE

No.

78 **The population dynamics of Nepal,** by Judith Banister and Shyam Thapa, December 1981, viii + 119 pp.

79 **Migration and unemployment in Hawaii,** by Robert D. Retherford, January 1982, vi + 18 pp.

80 **The demographic situation in India,** by Mahendra K. Premi, February 1982, x + 152 pp.

60-E **The changing value of children in Turkey,** by Cigdem Kagitcibasi, June 1982, viii + 100 pp.

81 **Labor markets, urban systems, and the urbanization process in Southeast Asian countries,** by Terence G. McGee, July 1982, vi + 28 pp.

32 **Ethnicity, birthplace, and achievement: the changing Hawaii mosaic,** by Paul Wright and Robert W. Gardner, February 1983, vi + 41 pp.

83 **Population distribution policies in Asia and the Pacific: current status and future prospects,** by Roland J. Fuchs, February 1983, viii + 40 pp.

84 **Circulation and interpersonal networks linking rural and urban areas: the case of Roi-et, Northeastern Thailand,** by Paul Lightfoot, Theodore Fuller, and Peerasit Kamnuansilpa, March 1983, vi + 46 pp.

85 **Development perspectives and population change,** by Ozzie G. Simmons, April 1983, vi + 41 pp.

86 **The effects of induced abortion on subsequent reproductive function and pregnancy outcome: Hawaii,** by Chin Sik Chung and Patricia G. Steinhoff in collaboration with Roy G. Smith and Ming-Pi Mi, June 1983, xii + 144 pp.

60-F **Influences on childbearing intentions across the fertility career: demographic and socioeconomic factors and the value of children,** by Rodolfo A. Bulatao and James T. Fawcett, June 1983, x + 152 pp.

87 **Population mobility and wealth transfers in Indonesia and other Third World societies,** by Graeme J. Hugo, July 1983, vi + 50 pp.

88 **Structural change and prospects for urbanization in Asian countries,** by Gavin W. Jones, August 1983, vi + 46 pp.

89 **Urban growth and local taxes in less developed countries,** by Roy Bahl, Daniel Holland, and Johannes Linn, September 1983, vi + 33 pp.

90 **A false fertility transition: the case of American blacks,** by Paul Wright and Peter Pirie, February 1984, viii + 81 pp.

60-G **The old-age economic security value of children in the Philippines and Taiwan,** by Susan De Vos, March 1984, viii + 72 pp.

91 **A profile of Hawaii's elderly population,** by Eleanor C. Nordyke, Richard K.C. Lee, and Robert W. Gardner, August 1984, viii + 39 pp.

92 **City characteristics, migration, and urban development policies in India,** by Mahendra K. Premi with Judith Ann L. Tom, June 1985, viii + 127 pp.

93 **Urbanization in China: new insights from the 1982 Census,** by Sidney Goldstein, July 1985, vi + 73 pp.

94 **Comparison of fertility trends estimated alternatively from birth histories and own children,** by Robert D. Retherford and Iqbal Alam, July 1985, viii + 39 pp.

95 **Population mobility in the People's Republic of China,** by Sidney Goldstein and Alice Goldstein, October 1985, vi + 46 pp.

THE EAST-WEST CENTER is a public, nonprofit educational institution with an international board of governors. Some 2,000 research fellows, graduate students, and professionals in business and government each year work with the Center's international staff in cooperative study, training, and research. They examine major issues related to population, resources and development, the environment, culture, and communication in Asia, the Pacific, and the United States. The Center was established in 1960 by the United States Congress, which provides principal funding. Support also comes from more than 20 Asian and Pacific governments, as well as private agencies and corporations.

Situated on 21 acres adjacent to the University of Hawaii's Manoa Campus, the Center's facilities include a 300-room office building housing research and administrative offices for an international staff of 250, three residence halls for participants, and a conference center with meeting rooms equipped to provide simultaneous translation and a complete range of audiovisual services.

THE EAST-WEST POPULATION INSTITUTE, established as a unit of the East-West Center in 1969, carries out multidisciplinary research, training, and related activities in the field of population, placing emphasis on economic, social, psychological, and environmental aspects of population problems in Asia, the Pacific, and the United States.

ISBN 0-86638-074-4 $3.00